METHOD AND ARRANGEMENT FOR THE PRODUCTION OF LIGNOCELLULOSE-CONTAINING BOARDS

FIELD OF THE INVENTION

[0001] The present invention relates to a method for continuously producing lignocellulose-containing boards. More particularly, the present invention relates to apparatus for carrying out such a method.

BACKGROUND OF THE INVENTION

[0002] Methods of producing lignocellulose-containing board are well known in the art, and have found wide use in practice. The manufacture of such boards includes the following main steps: disintegration of the raw material into particles and/or fibers of appropriate size, drying the particles and/or fibers to a predetermined moisture quotient, and glue-coating the material either prior to or subsequent to the drying process, shaping the glue-coated material to form a mat, which may comprise several layers, and optionally cold pre-pressing the mat, preheating the mat, water-spraying mat surfaces, etc., and heat pressing the mat in a discontinuous press or in a continuous press while simulataneously subjecting the material to heat and pressure so as to obtain a finished board. It is difficult to control the quality of the boards produced in accordance with this known method with respect to the moisture content, temperature and dimensional stability of the boards. When the boards leave the heat pressing state of the production process, they have a temperature in excess of 100°C and a corresponding vapor pressure. The temperature of the board surfaces falls rapidly to beneath 100°C as the enclosed moisture is vaporised by virtue of a so-called flash effect. The boards are then cooled in cooling wheels. As a result, the boards will obtain a moisture content of about 6% to 7% after intermediate storage of the board over a period of a day or two. In many applications this creates a problem, particularly in environments which have a higher average relative humidity, since the boards will take up moisture when used and thus

undergo dimensional changes, as in the case of all lignocellulose-containing materials. One way of counteracting this is to spray water on the boards as they leave the press.

[0003] Another known phenomenon is that boards produced in this manner obtain different moisture contents in the surface layers relative to the core layer. If the boards are used for some type of surface treatment, for instance, such as lamination, without having earlier equalised the difference in moisture content, the dimensions of the board may change when this equalisation takes place, so that the surface layer loosens. In order to achieve desired equalisation between the various layers, it is customary to thus store the boards for a number of weeks.

[0004] Another known problem is that the boards are not dimensionally stable when they leave the press. This is noticeable primarily because the boards shrink or swell over a process that can take one or more days. Consequently, calibration grinding of the boards is not normally undertaken until the boards have been stored in intermediate storage locations over a number of days.

[0005] Another known problem is that the boards are too hot to be stacked and stored when leaving the hot press. If the boards are too hot when stacked, the glue joints may begin to break down, and the boards will consequently be weakened. This problem is normally alleviated by keeping the boards in a cooling wheel, in which the board temperature is lowered by natural convection.

[0006] It will be evident from the aforegoing that the conventionally used press and board production techniques involve a number of cost-inducing handling stages and intermediate storage subsequent to the actual board manufacturing process. Accordingly, one object of the present invention is to stabilise a board with respect to its moisture content, temperature and dimensional stability in a continuous process, and in that manner avoid cost-inducing handling and storage of the board. Because dimensional stability is

achieved, the boards may also be ground or sanded down to a final thickness directly after manufacture.

SUMMARY OF THE INVENTION

[0007] In accordance with the present invention, these and other objects have now been realized by the invention of a method for continuously producing lignocellulose-containing boards comprising providing a mat of disintegrated, glue-coated and dried lignocellulose-containing material, pressing the mat into a board in a steam injection press, conditioning the board by drawing a predetermined volume of air having a predetermined moisture content at a predetermined temperature through the board by means of suction applied through the board, and grinding the conditioned board to a final thickness directly following the conditioning step. In a preferred embodiment, the conditioning of the board comprises a first conditioning of the board by drawing a first predetermined volume of air having a first predetermined moisture content at a first predetermined temperature through the board in a first direction by means of suction applied through the board, and including a second conditioning of the board by drawing a second predetermined volume of air having a second predetermined moisture content at a second predetermined temperature through the board in a second direction by means of suction applied through the board, wherein the second direction is opposite to the first direction.

[0008] In accordance with one embodiment of the method of the present invention, the pressing of the mat into the board provides a board having a pair of surface layers and a center layer, and wherein the pair of surface layers and the center layer have substantially the same density.

[0009] In accordance with the present invention, these and other objects have also been realized by the invention of apparatus for continuously providing lignocellulose-containing boards from a mat of disintegrated, glue-coated and dried lignocellulose-containing material, the apparatus comprising a steam injection press for pressing the mat into a board,

conditioning means comprising an air supply unit for passing the air through the board as the board passes through a conditioning zone, and a grinder for grinding the conditioned board to a final thickness directly following the conditioning zone. In a preferred embodiment, the conditioning means comprises first conditioning means comprising a first air supply unit for passing the air through the board in a first direction and including second conditioning means comprising a second air supply unit for passing the air through the board in a second direction, the second direction being opposite to the first direction.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The present invention will now be described in more detail with reference to the following detailed description which, in turn, refers to the accompanying drawing, in which:

[0011] The figure is a side, elevational, longitudinal sectional view of a plant constructed in accordance with the present invention.

DETAILED DESCRIPTION

[0012] The plant illustrated in the drawing is based on the plant disclosed in Swedish Patent No. 504,638, which describes a continuous steam injection process. Turning to the drawing, a mat 1 formed from lignocellulose-containing material is fed into a continuous steam injection press 2 and pressed into boards 3 therein. The boards exiting from the continuous steam injection press 2 enter an after-conditioning zone 4. In the illustrated example, the zone 4 includes two after-conditioning units, 5 and 6. The boards can be transferred directly to a grinder 7 from the after-conditioning zone 4, for grinding of the board to a final thickness.

[0013] In accordance with the present invention, each after-conditioning unit, 5 and 6, comprises an air supply unit 8 that includes a suction fan 9 and a heater 10. A steam or water supply device 11 may also be provided for moistening the air. The air is sucked into the two air supply units at 12. As will be seen from the drawing, the air is delivered from above

in the case of after-conditioning unit 5, and from beneath in the case of after-conditioning unit 6.

[0014] Thus, as the boards exit from the continuous steam injection press 2 they pass into the after-conditioning zone 4 in which air is sucked through the boards with the aid of negative pressure in an amount determined in relation to board production and at a specific moisture content and temperature. In the first after-conditioning unit 5, the air is sucked down through the board, whereas in the after-conditioning unit 6 the air is sucked through the board in the opposite direction, i.e. upwards. However, this double air flow in mutually opposite directions is not necessary in order to achieve the desired effect, since in certain cases the throughflow of air in only one direction will suffice, meaning that only one after-conditioning unit will be required.

[0015] It can be mentioned by way of example that a board having a density of 600 kg/m^3 and a thickness of 16.6 mm is cooled from 100 to 60°C in 60 seconds when applying a subpressure of 15 kPa. By way of another example, a board having a density of 600 kg/m^3 and a thickness of 32 mm can be correspondingly cooled in 80 seconds.

[0016] It will also be noted that a board having a thickness of 10 mm and a density of 650 kg/m^3 and produced in accordance with the present invention in a pilot plant obtained a stable thickness after having passed through the after-conditioning zone. Measurements made one or more days after manufacture showed that boards which had passed through the after-conditioning zone retained their thickness, whereas boards that had not passed through that zone were often liable to shrink up to 1 mm within a day or two, in the same way that conventionally manufactured board also shrinks.

[0017] Conventionally produced boards have an enhanced density at their surfaces. However, because it is possible to produce boards in the steam injection press that do not have an enhanced surface density, the air throughflow and therewith conditioning of the board and lowering of its temperature can

be effected more quickly than in the case of conventional board handling techniques.

[0018] Although the invention herein has been described with reference to particular embodiments, it is to be understood that these embodiments are merely illustrative of the principles and applications of the present invention. It is therefore to be understood that numerous modifications may be made to the illustrative embodiments and that other arrangements may be devised without departing from the spirit and scope of the present invention as defined by the appended claims.